

Technology (AT) Reutilization (Reuse): What We Know Today

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Abstract: The history, scope, and evolving definitions of assistive technology reutilization activities, from both grassroots and legislative perspective, are discussed. A national classification system of AT reuse activities and data gathered from several national surveys of AT reutilization programs using this classification approach are presented. The rationale, benefits, and potential perils of AT reuse are discussed from the viewpoint of suppliers, consumers, agencies, and organizations engaged in AT reutilization activities. Examples of both successful and damaging AT reutilization initiatives are cited with cautionary recommendations to organizations interested in establishing or expanding AT reutilization initiatives. The role of the National Assistive Technology Reutilization and Coordination Technical Assistance Center (Pass It On Center) is shared. The value and limitations of the current AT reuse data and outcomes are discussed and recommendations for future research on AT reutilization activities and outcomes are offered.

Keywords: Assistive technology reutilization, Assistive technology reuse

The Beginnings of Assistive Technology Reutilization

The reutilization, or 'reuse,' of assistive technology (AT) is a service born of need. In today's world of increasing demand and shrinking resources for AT, individuals with disabilities, their family members and

caregivers, and disability service organizations often consider reutilized AT as an affordable, and, for some, the only solution to overcoming insurmountable financial barriers. From local grassroots efforts in the 1980s, reutilization (hereafter referred to as reuse) has grown to become a nationally-recognized response for providing AT to those people who would otherwise 'go without.'

One of the earliest known reuse organizations, National Cristina Foundation, was established in 1984 to put technologically obsolete but usable computers into the hands of people with disabilities (National Cristina Foundation, 2000-2008). Another nationally renowned non-profit organization, Friends of Disabled Adults & Children, Too (FODAC, 2007), began in one person's basement that was essentially a storage space for a few wheelchairs. The organization has since refurbished over 20,000 wheelchairs, 5,500 hospital beds and many other types of durable medical equipment (DME) since 1986. Undoubtedly, there were many more local groups collecting and redistributing DME through various organizations (e.g., Easter Seals, United Cerebral Palsy, and the Muscular Dystrophy Association) but there was no unifying voice around AT reuse at the time.

Legislative Catalyst for Expansion of AT Reuse Programs

In 1988, Congress passed the Technology-Related Assistance for Individuals with Disabilities Act (Tech Act) to give states

funds a catalyst to develop creative strategies to reduce AT access barriers. The Tech Act was the first federal legislation to define both AT devices and services. The Tech Act of 1998 defines an AT device as “any item, piece of equipment, or product system whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities” [§3(a)(3)]

AT services are defined as “any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device” [§3(a)(4)] and the purposes of the act such as “purchasing, leasing or otherwise providing for the acquisition of assistive technology devices by people with disabilities” and “selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing, or replacing of assistive technology devices” [§3(a)(4)(B)], set the stage for states to devise many creative strategies one including AT reuse.

Equipment exchange and ‘recycling’ services began to flourish in the 1990’s and early 2000’s to address intractable systemic funding barriers and the consumer-driven demand for AT (National Assistive Technology Technical Assistance Partnership, 2000). Some states established both print and electronic equipment exchange services that allow sellers and buyers to exchange equipment; other states launched new programs or supported the expansion of existing programs for simple redistribution of usable AT; and still others incorporated refurbishing services to restore and repair equipment otherwise unusable. A variety of program models emerged, all focused primarily on addressing unmet needs of persons with disabilities who, for many different reasons, were not obtaining AT devices and services needed for living, working, learning or playing, inclusively or independently. In addition, many other private, community-based organizations

initiated or expanded existing reutilization services to respond to these unmet consumer needs.

Rapid innovation in electronics accelerated the replacement rate of technologies such as computers and lead to a surplus of outdated, yet reusable, equipment (National Safety Council, 1999). This abundance of equipment and unmet consumer needs for computer technology led to the proliferation of computer refurbishing programs, often spurred on by the lively dialogue and technical assistance of Yvette Marin, the Executive Director of the National Cristina Foundation, who sought to encourage donations of surplus computers from corporate partners for use by people with disabilities (National Cristina Foundation, 2000-2008).

The 1994 amendments to the Tech Act allowed states to develop model systems that would “support activities to increase access to, and funding for, assistive technology” [§101(b)(1)]. Further, the 1994 Act set the stage for inclusion of public and private sector collaboration around “development, demonstration and dissemination of assistive technology devices, and the ongoing provision of information about new products to assist individuals with disabilities” [§101(b)(1)(A)(B)].

In the 1998 reauthorization, reuse is identified in the statute as a formal (though discretionary) activity. State AT Act Programs could develop systems for the “maintenance of information about, and recycling centers for, the redistribution of assistive technology devices and services” [§101(b)(3)(A)(i)(I)(iii)]. With the Tech Act reauthorization in 2004, AT reutilization is specifically identified as a quasi-mandatory activity [§4(e)(2)(B)] whether the reuse activity was funded under AT Act funds to the state or through other state or non-federal funds[§4(f)(2)(B)(iv)]. The AT Act of 2004 allows the state to:

directly, or in collaboration with public or private entities, carry out assistive technology device programs that provide for the exchange, repair, recycling, or other reutilization of assistive technology devices, which may include redistribution through device sales, loans, rental or donations. [§4(e)(2)(B)]

This evolution in the Act is significant because private entities such as manufacturers and suppliers are critical to the success of AT reuse programs. They offer standards and guidelines for the sanitization and repair of specific types of equipment, can clarify when equipment or equipment parts are no longer usable, and sometimes perform repairs or reuse services under fees-for-services contracts.

As more programs of this kind developed and expanded, the Rehabilitation Services Administration (RSA) launched its AT reuse initiative designed to promote *safe, appropriate* and *effective* AT reuse described later in the manuscript. Leading up to RSA's initiative were a number of early, national efforts designed to bring together public, private and even international AT reutilizers, consumers, manufacturers, and state AT programs to look at operational strategies and issues which will be discussed in the next section.

Early National Efforts to Forge a Unified, Collaborative Vision for AT Reuse

In March, 1999, the RESNA Technical Assistance Project and the Assistive Technology in New Hampshire program hosted the first national conference, 'Discovering Hidden Resources: AT Recycling, Refurbishing and Redistribution,' to (a) address emergent needs of AT reuse programs; (b) facilitate sharing of information; and (c) forge a vision of a national system that would support procurement, distribution, and

reassignment of reutilized AT by these programs. This conference resulted in an informative monograph that included a first attempt at definitions used in recycling AT equipment; identification of the benefits of recycled AT for suppliers, students and individuals with disabilities; descriptions of models for AT reutilization programs and the components of computer recycling programs; an overview of international AT recycling efforts; and, a first attempt to clarify issues of national importance pertaining to reutilized AT (National Assistive Technology Technical Assistance Partnership, 2000). This conference and monograph set the stage for future policy and programmatic developments in the emerging AT service delivery field and was a catalyst to move forward the notion of promulgating safe, appropriate, and effective reutilization of AT as a 'hidden resource' to address intractable AT funding barriers.

AT Reuse: Finding Partners for Successful Practices

In May, 2000, the RESNA Technical Assistance Project and Tools for Life (2008) hosted the second national conference on AT reuse in Decatur, Georgia. More than 45 representatives of state AT programs, manufacturers, AT recycling organizations, and third-party organizations participated (National Assistive Technology Technical Assistance Partnership, 2000). This conference stressed the need for continuing conversations among existing and potential partners, the need to identify best practices, costs and benefits, and the need to develop sustainable AT reuse services that support consumers, manufacturer/suppliers, and organizations involved in these initiatives. Two reutilization programs in Georgia—FODAC (2007) and the ReBoot computer reutilization program (Touch the Future, Inc., n.d.)--were toured to give participants a closer look at how successful reuse can enhance partnerships among suppliers, manufacturers and end-users. The conference also

spotlighted how several reuse programs offer job skills training, industry certification, and employment as computer and durable medical equipment repair technicians to individuals with disabilities.

Early Definitions of Reused/Reutilized AT

One issue that confounds research is nomenclature. Without clear definitions of the types of AT reuse activities, definitive research is not possible. Early AT reuse activities were often referred to as “recycling” activities. The RESNA TA Project defined reused AT equipment as follows: “Recycled assistive technology equipment is any piece of used equipment, device or aid, that is now capable of being reused by someone else,” (NATTAP, 2000, p. 3) and clarified that recycling programs (e.g., in the late 1990s) interchangeably used terms such as “reutilization, refurbishing, or redistribution” (NATTAP, p. 3) in program descriptions. RESNA reported that, to manufacturers and those involved in waste management, the term ‘recycle’ refers to the breaking down of the product for purposes of retrieving and reusing that which is usable in some manner or form, or end-of-life reprocessing (NATTAP; Environmental Protection Agency, 2008). More precise definitions of reuse evolved to clarify and quantify specific reuse activities for the purpose of understanding of some quantitative outcomes from a national perspective.

Quantitative Reporting of Initial AT Reuse Data Using Expanded Definitions of AT Reuse

The AT Act of 2004 increased accountability by requiring states to report data to measure “the number, type, estimated value, and scope of assistive technology devices exchanged, repaired, recycled, or reutilized (including redistributed through device sales, loans, rentals, or donations) through the device reutilization program” [§4(f)(2)(B)(iv)] as a

way to fulfill the intent of the law to increase acquisition of assistive technology devices and services.

Under a grant from the Rehabilitation Services Administration (RSA), the Association of Assistive Technology Act Programs (ATAP) developed a reporting protocol called the National Information System for Assistive Technology (NISAT; Association of Assistive Technology Act Programs, n.d.) for states to use in collecting the data required by the law and to provide a consistent national basis for reporting aggregate state AT Act data to Congress. The reporting protocol approved by the Office of Management and Budget allows states to estimate the original value of the devices that are exchanged or refurbished/repaired/recycled, along with the amount spent to obtain the device. Programs may use the manufacturer’s suggested retail price (MSRP) to determine the original value of the device. If the exact price for that particular item cannot be found, an attempt must be made to locate a comparable item and the price for that device must be used. Estimates may be used as an acceptable alternative when exact pricing information is not available (Association of Assistive Technology Act Programs).

The NISAT instructional guide defined two distinct types of AT reuse activities:

1. *Device exchange activities.* These are activities in which devices are listed in a ‘want ad’ type posting and consumers can contact and arrange to obtain the device (either by purchasing it or obtaining it freely) from the current owner. Exchange programs do not involve warehousing inventory and do not include repair, sanitation, or refurbishing of used devices. In some cases the statewide AT program acts as an intermediary

during the exchange; in other cases the statewide AT program is not involved in the transaction.

2. *Device refurbishment/repair/recycling activities.* These are activities in which devices are accepted (usually by donation) into an inventory, are repaired, sanitized, and/or refurbished as needed, and then are offered for sale, loan, rental or give away to consumers as recycled products. Repair of devices for an individual (without the ownership of the device changing hands) should be reported as device recycling. Open-ended device loans, in which the device borrower can keep the device for as long as it is needed, are a form of device reuse and are reported as device recycling (Association of Assistive Technology Act Programs, n.d.).

Initial Quantitative Outcomes of AT Reuse Reported by State AT Act Programs

Prior to completion and approval of the NISAT data collection protocol, the ATAP (n.d.) developed an interim data collection tool to capture data on AT Program activities. ATAP, which represents 54 of the 56 AT Act Programs, requested that its members voluntarily submit data collected between October 1, 2005, and September 30, 2006, using the interim voluntary data tool. Thirty-five states submitted data using the interim data reporting tool. Of the 35 states submitting data, 24 reported operating reuse, exchange, or long-term loan programs or a combination of programs. States reported reuse of a total of 5,602 devices. Of these, 678 devices were exchanged, 4,482 devices were reassigned, and 442 devices were on long-term loan. Devices for seating, positioning and wheeled mobility, and computer/computer-related devices constituted two of the top three types of devices acquired through each category of

reuse program (i.e., exchange program, reassignment program, or long-term loan program). Devices for daily living were ranked behind seating, positioning and wheeled mobility and computer/computer related devices for exchange or reassignment programs. Recreation and leisure equipment was ranked behind seating, positioning, and wheeled mobility and computer/computer-related devices acquired under a long-term loan. Altogether, the data collected from 24 state AT programs showed that 4,765 received used devices (which meant many people received more than one device because the collection was based upon the number of persons who received devices, not the number of devices exchanged, reassigned, or on a long-term loan.). These consumers saved \$5,014,921 (i.e., the cost savings estimated by subtracting the cost of used devices from the MSRP if purchased new; Buzzell, 2007).

A Closer Examination of the RSA Initiative on AT Reuse

The need for affordable AT and the new requirements for state AT Act programs to address these needs, in part through reuse initiatives, resulted in a national conversation to better understand the opportunities and challenges of AT Reuse. The RSA, the NATTAP, and Tools for Life--Georgia's state AT Project--jointly hosted the third national conference on AT reuse in May, 2006. This conference, the *Pass It On Conference on AT Reuse*, drew over 200 participants including individuals with disabilities, reuse organizations, state programs, suppliers and manufacturers. This diverse group identified that AT reuse programs need to know more about best practices in a range of topics including storage; transportation/distribution; staffing; volunteers; tracking and managing inventory; data collection; marketing and public awareness; sustainability and funding; appropriate disposal of devices; finding and retaining qualified staff; training staff and

volunteers; determining the acceptability of devices (age, condition, type); matching person to device; providing training and follow-up to consumers; standards for cleaning and repairing; and liability and insurance.

Under the leadership of John Hager, Assistant Secretary of the Office of Special Education and Rehabilitation Services (OSERS), RSA announced at the May, 2006, conference the availability of funds for grants to establish model demonstrations of AT reuse, to support technical assistance activities to these grantees and others involved in AT reuse activities, and to address issues of national importance to organizations involved in these activities. The goal of RSA's reuse initiative is "to increase the availability of assistive technology through promoting and supporting the appropriate, effective reuse of AT devices at the state and local level" (Buzzell, 2007, p. 3). The support of OSERS is manifested in the programs it administers--the 87 AT reuse programs operated by state AT Act programs and U.S. territories, 12 AT reuse demonstration grants, and one technical assistance center on AT reuse (i.e., the Pass It On Center).

National Efforts to Consider the Numbers and Types of AT Reuse Programs

As a part of planning efforts for the Pass It On Conference, the NATTAP staff conducted the first nationwide effort to identify the numbers and types of AT reuse initiatives. A questionnaire, developed and disseminated via email to state AT Programs, was designed to gather initial information about the numbers and types of reuse programs, the types of organizations involved in reuse activities, the types of AT reutilized, and limitations with respect to the populations served by these programs (e.g., a specific age group, type of disability, type of AT reutilized, or purpose of the AT reuse

program). NATTAP compiled questionnaire data from 40 respondents (i.e., one respondent per state) who reported a total number 633 AT reuse programs. NATTAP included four types of AT reuse programs in the questionnaire and respondents (i.e., state AT program personnel) reported on the number of programs operating in their state. Of 633 AT reuse programs, 111 (18%) were classified as AT exchange programs; 487 (77%) were classified as AT recycling programs; only 1 (<1%) program was classified as a reuse program other than an exchange or recycling program; and 34 (5%) of the reuse programs were reported but not classified in the above categories and were classified as not sure. Respondents also reported that durable medical equipment devices are the most frequent type of devices reutilized (64% of all devices reutilized by these programs) and a significant majority of respondents reported AT reuse programs serve a specific geographic locality (Pass It On Center, 2006). Respondents also reported on the many types of organizations involved in AT reuse: independent living centers, university medical centers, assistive technology resource centers, civic organizations such as Lions Clubs, and various groups like the Muscular Dystrophy Association.

State AT program staff completed the questionnaire based upon their knowledge of reuse initiatives in their respective state. The data represents the first national effort to collect initial information about the extent and scope of AT reuse programs reuse activities and devices. This information along with significant and diverse perspectives of over 200 participants--representatives from AT reuse programs, state AT Act programs, manufacturers, suppliers, state agencies and individuals with disabilities--who participated at the Pass It On Conference, suggest policy implications to be addressed by decision-makers at many levels to assure that AT reuse

is safe, appropriate, cost-effective, and sustainable. The data from the questionnaire is limited by its informality and by the fact that many state AT program respondents were unable to categorize the specific limits of the populations served: of 633 reported AT reuse programs, 283 could not be categorized by specific program limits (e.g., geographic area served, type of disability or ages served, etc.). Further, the results of the questionnaire suggested a need for clearer definitions for various types of reuse activities through which a more specific classification of the types of reuse programs could be accomplished.

In a subsequent 2006 effort to gather more specific and better-documented data, and to provide a useful tool to help consumers, families and providers locate reused AT, NATTAP established a public, on-line database to locate and classify AT reuse programs (Pass It On Center, 2007). NATTAP asked state AT Act programs and the organizations known to be engaged in AT reuse activities to populate this database which includes such information as how to contact programs, the type of AT reuse activity or activities offered, the types of devices reutilized, and types of disabilities served. A 2007 classification report of data collected on this site found that 154 AT reuse programs had directly listed program information on the NATTAP site. Of these programs, 60 reported that they refurbish AT (49 of which reuse mobility, seating and positioning devices); 45 reported that they reassign AT (39 of which reuse mobility, seating and positioning devices); 26 reported that they operate an AT exchange program; and 11 reported that they operate all three types of AT reuse programs (Pass It On Center). The aggregated data compiled from the database provides a more realistic picture of the numbers and scope of AT reuse efforts nationwide. Whereas NATTAP reported a total of 633 AT reuse programs from the first questionnaire, only 154 AT reuse programs

were listed in the database in 2007. In follow-up calls to state AT program respondents who reported significantly more reuse programs on the questionnaire than on the database, NATTAP learned that some respondents included many small AT reuse initiatives on the questionnaire; these initiatives would not be appropriate to list on the national, public database (J. Kniskern, personal communication, September 17, 2007).

Challenges of AT Reuse

The RSA has defined ‘appropriate’ reuse as reuse that is “safe for reusers and meets the needs of consumers and reutilizers, results in positive outcomes for consumers, and is environmentally friendly” (Buzzell, 2007, p. 17). ‘Effective reuse’ is that which “produces cost savings or is cost-neutral, is sustainable, and has a positive or neutral effect on the AT field” (Buzzell, p. 21). In a presentation entitled “Addressing the Challenges in the Reuse of Assistive Technology” (Buzzell, 2006) to the Interagency Committee on Disability Research, RSA reported a lack of research on AT reuse, with (a) only three reports being found describing AT reuse programs at the time, and (b) no economic or methodological studies of device reuse (Buzzell, 2006, 2007).

RSA further highlighted that the lack of research leaves no way to understand the benefits of AT reuse in terms of such variables as cost-savings to consumers, their care givers and/or agencies, obtaining AT that would otherwise not be available, or improvements in clinical outcomes (Buzzell, 2006, 2007). If measures were developed to determine the quality of a reuse program, would such measures include quantitative data (i.e, how many devices are reutilized, how many people are served) or other program efficiencies (Buzzell, 2006, 2007) such as the wait time between a consumer’s request and receipt of a device?

Although there are many different models of AT reuse programs (NATITAP, 2000), there have been no comprehensive, systematic studies to (a) consider the advantages, challenges, and perils of one type of AT reuse model over another; (b) document practices that lead to good outcomes; (c) identify how to achieve cost savings; or (d) know how to build sustainable AT reuse programs. In 2006, there was no central repository of information to help AT reuse programs to mitigate risk, reduce potential liability, understand legal and regulatory issues of federal agencies (e.g., Occupational Safety and Health Administration, Food and Drug Administration, Centers for Disease Control and Prevention, and Environmental Protection Agency) with potential interests in AT reuse (Buzzell, 2006, 2007). Further, there was scant information concerning the possible collaboration between AT reuse programs and third-party payer agencies (e.g., independent living services, vocational rehabilitation programs, or Medicaid) and the potential benefits and/or perils of such possible collaborations (Buzzell, 2006, 2007).

Given the numbers of public and private organizations engaged in AT reuse activities and the lack of information to inform decision-making about these various issues, RSA posed the question: 'How can these organizations ensure compliance with any relevant federal and/or state regulations applicable to AT reuse activities?' (Buzzell, 2006, 2007). Other questions concerned how programs would know the useful life of AT; what the overall impact on manufacturers and suppliers is; and, how the expertise of this industry can be engaged in productive dialogue with AT reutilizers, consumers, third-party payer organizations, DME/AT trade organizations, and environmental organizations. This dialogue focused on consideration of the benefits, outcomes, perils, and successful practices of AT reuse, given that AT reuse is happening across the

nation in many communities (Buzzell, 2006, 2007). Finally, as a cautionary note, the question was considered regarding steps that can be taken by policy-makers, state agencies, and AT reutilizers to assure that the individuals with disabilities will have the most appropriate assistive technology and the choice of a new or reutilized device.

Meeting the Challenges and Recommendations for New Definitions of AT Reuse

The National AT Reutilization and Coordination Technical Assistance Center (housed at the Pass It On Center) was awarded a cooperative agreement from RSA in October, 2006, to address the questions and challenges presented by RSA. Because AT reuse activities involve a diverse audience of stakeholders, one of the first steps of the Pass It On Center was to launch the National Task Force (NTF) on AT Reuse to engage the expertise and perspectives of nationally known leaders and organizations in the field. The first priority identified by the NTF was to clarify and expand the current definitions of AT reuse activities because definitions impact every other challenge presented for consideration--from legal and regulatory matters to the analysis of benefits and outcomes of different models of AT reuse programs.

The NTF Study Group on the Classification of AT Reuse Activities has adopted and is disseminating the following definitions for widespread adoption by reuse programs, state AT programs, suppliers and others:

1. *Device exchange*, in which organizations facilitate the transfer of a device from a consumer who does not need the device to a consumer who could use the device – without the organization taking possession of the device at any time.

2. *Device reassignment*, in which an organization accepts devices from donors and stores them until they can be given or sold to new owners.
3. *Device refurbishment*, in which an organization takes the additional step of repairing or restoring used devices to original manufacturer specifications before giving or selling the device to a new owner.
4. *Device remanufacturing*, in which an organization alters or enhances devices before giving or selling the device to a new owner.
5. *Device recycling*, in which an organization accepts devices from donors and breaks the devices down into component pieces for recycling and disposal.

Additionally, the Pass It On Center will review the limited AT reuse outcome and cost savings data reported by state AT Act Programs to RSA for the period October 1, 2006, through September 30, 2007, and will supplement this data with comparable data from other AT reuse organizations that are not funded under the AT Act or otherwise supported by State AT Act Programs. Additional information about the work of the Pass It On Center in identifying successful practices, quality indicators, consumer-choice, and pertinent regulatory information about AT reuse is available (<http://www.passitoncenter.org>).

What We Know About AT Reuse Outcomes and Benefits

A review of literature shows scant evidence of research on AT reuse outcomes and benefits. An earlier Québec qualitative analysis of interviews with consumers, suppliers, professional service providers, and government administrators explored what contributed to the development of successful AT reuse policies, such as the involvement of

diverse stakeholders, along with the benefits and disadvantages of such programs (Vincent, 1999). Another early study compared reuse programs to consider their feasibility (Burke, 1997). It is beyond the scope of this article to analyze the methodologies of these studies. However, these two studies, along with several other studies (J. Kniskern, personal communication, May 14, 2008) that includes a recently completed doctoral but not yet published dissertation (Bean & Morgan, 2008), will contribute to the substantive research needed on AT outcomes and benefits to inform reuse practices. A few reuse programs are beginning to explore the outcomes (a) of using technology to streamline program operations; (b) of cost-savings to consumers who acquire reutilized AT; and (c) to consumers three months after having received AT.

One example of a program that is exploring outcomes and benefits is FODAC which has refurbished and reassigned 20,000 wheelchairs since 1986. In 2004, FODAC implemented an electronic database to track quantitative data on disabilities and the types of refurbished/reassigned equipment matched to prioritized customer requests. It includes performance measures concerning why users consider reusable AT (i.e., denial from Medicaid, Medicare, or economic situation) and how they believe the AT they received will benefit them (i.e., school, work, community-living, independence, or developmental progress/recreation).

Another example is Paraquad (2008), a community-based, university-affiliated AT refurbishing and reassignment program which conducts three- to six-month follow-up surveys to measure changes in functional performance and inclusion in community activities of persons pre-owned AT. A unique aspect of Paraquad is its affiliation with the clinical staff from the School of Occupational Therapy at Washington University. This

partnership has resulted in pre-and post service benefits and outcomes research studies that can inform decisions about the potential benefits and pitfalls of AT reuse.

A third program, the Kansas Equipment Exchange, reports data such as the wait time for 'average stock of AT (Kansas Equipment Exchange, 2003). The program can respond to many requests immediately, but most applicants have a wait time of three months. The delays must be balanced against the number of devices collected, refurbished and reassigned (Equipment for Independence, 2007) to respond to unmet needs for AT. What else is there to learn from these examples and what kinds of methodologies would be appropriate to measure the outcomes and benefits of AT reuse programs?

The field of AT outcomes measurement is complex because of variations in the (a) types of disabilities, (b) types of AT, (c) ages of persons using AT, and (d) settings and context in which AT is used (Johnson, Gratz, Rust, & Smith, 2007; Peterson-Karlan & Parette, 2007). The measurement of AT reuse outcomes is even more complex because all of the above variations apply as well as other variations in the types of AT reuse programs, the age of devices being reused, and the need to clarify what will yield the most useful information about AT reuse services for decision-makers. A review of literature on AT outcomes and benefits cited by the Assistive Technology Outcomes Measurement (ATOMS) project shows most of the focus of research is on development and models of interventions (Smith, Seitz, & Rust, 2006). In comparison, the emerging field of reuse outcomes and benefits currently focuses on such measures as helping persons with disabilities acquire AT they otherwise would not be able to access, cost-savings as a result of the interventions, and the satisfaction of the individual with the reused AT.

A newer tool from the ATOMS project allows researchers to gather user-specific information (e.g., frequency of use, settings of use, perceptions of whether the device aids the user in reaching goals, satisfaction with services, AT cost data, etc.) at intervals before and after receipt of AT (Sprigle & Harris, 2004). An instrument like the ATOMS tool might be adaptable for the analysis of benefits and cost savings to customers of reuse services. However, even this instrument does not allow for the examination of certain reuse program efficiencies that impact users, or the sustainability of AT reuse programs and raises numerous questions: What kinds of outcomes are relevant to consider? The benefits to consumers in functional activities or receipt of devices they cannot otherwise obtain? The advantages to agencies and third party-payers? Cost savings? Reduction of waste and environmental pollutants? These are some of the questions that can be explored through future research.

A Need for Outcomes and Benefits Research on Manufacturer and Supplier Relationships

Research concerning the outcomes and benefits of AT reuse on manufacturers and suppliers is also needed. Some AT reuse programs have reported at meetings and conferences that they have carefully cultivated strong and positive relationships with manufacturers and suppliers of AT. The suppliers can refer to reuse programs those customers who have no direct or third-party source of funding. In turn, the reuse programs can provide back-up and interim AT solutions while the customer waits for third-party payer approvals (Hostak, 2007). Manufacturers and suppliers also can advise AT reuse programs about technology that has been recalled, banned, or has passed its useful life. They can assist programs in determining the useful life of complex AT (Hostak). In spite of these anecdotal reports, no research on the benefits and outcomes of AT reuse to manufacturers

and suppliers is evident from literature searches (ATOMS, 2007; RESNA), and yet, there is clearly a need for all stakeholders to collaborate in understanding mutually beneficial models of AT reuse (Hostak).

A Need for Outcomes and Benefits Research on Third-Party Payers Relationships

Some state Medicaid agencies are considering reused AT as a way to contain costs in response to budget constraints and increasing demand (Hostak, 2007). Lessons learned from a New Jersey Medicaid reuse effort as well as from European countries (Hostak), suggest that third-party payers should offer reutilized AT as an option--not a 'pre-requisite'--to obtaining agency-purchased equipment. The Pass It On Center is examining the success of partnerships and practices in working with third-party payers. The Kansas Equipment Exchange is one such example. The program reports savings of two million dollars through its collaborative partnership with Kansas Health Care Policy (Medicaid) and the leadership of the University of Kansas. Kansas Medicaid spends 10 million dollars each year on equipment, and approximately one-third of this equipment may be suitable for reuse. The partnership includes strong working relationships with AT suppliers who are paid for refurbishing and repair services done by vendor-certified repair technicians. The program deals primarily with durable medical equipment, but is now expanding its efforts to refurbish personal digital assistants (PDAs), global positioning systems (GPS), and other types of AT (Kansas Equipment Exchange, 2003).

A Need for Outcomes and Benefits Research on the Environmental Impacts of AT Reuse

Finally, there is a need for more outcomes and benefits research to determine the environmental impact of AT reuse efforts. Environmental impact data resulting from the

reuse of AT are not a measurement states are required to collect, nor is it voluntarily collected by most state AT Act Programs. However, it may be useful data concerning the outcomes and benefits of AT reuse. For example, other recycling industries report data that shows significant 'savings of energy use' resulting from recycling of iron and steel (74%), recycled paper (64%) and recycled plastic (more than 80%) (Farzad, 2008). Some AT reuse programs are capturing preliminary environmental impact data: the AT for Kansans Project and Kansas Health Care Policy (Medicaid) received a Kansas 2007 Pollution Prevention Award for keeping 1,800 devices out of landfills (Kansas Department of Health and Environment, 2007).

Summary and Recommendations

The body of current data on AT reuse outcomes is focused on quantitative, not qualitative, research that indicates a compelling need for outcomes and benefits studies useful to inform the decision-making of policy makers, suppliers, manufacturers, consumers and all stakeholders. Such research is essential to inform the development of successful reuse practices. Informed consumer choice in decisions about whether to accept an appropriate reuse device or seek a new one is another area of need for research. Reuse programs and policy-makers can also benefit from carefully planned research of return-on-investment (ROI) studies and potential benefits to consumers as measures of changes in functional performance, inclusion in major life activities, and consumer satisfaction ratings of the AT reuse services and the actual device.

Acknowledgement

This work is supported under a five-year cooperative agreement awarded by the U.S. Department of Education, Office of Special

Education and Rehabilitative Services (#H235V060016), and is administered by the Pass It On Center of the Georgia Department of Labor – Tools for Life. However, the contents of this publication do not necessarily represent the policy or opinions of the U.S. Department of Education, or the Georgia Department of Labor, and the reader should not assume endorsements of this document by either entities.

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